We claim

1. An improved process for the preparation of fatty acid alkyl esters suitable for use as biodiesel, said process comprises the steps of,
   a. reacting fatty acid glycerides with an alcohol having 1-4 carbon atoms in the molar ratio of 3:1 to 30:1 of fatty acids and triglycerides respectively, at a temperature ranging between 70-300°C, pressure in the range of 1-30 bar, in presence of a organometalic catalytic compound of Tin with concentration of catalyst is in the range of 0.01 to 3 weight percent of the fatty acid glycerides;
   b. obtaining ester with glycerol;
   c. separating the glycerine from the fatty acid alkyl ester as immiscible phase by decantation;
   d. purifying the fatty acid alkyl esters by washing with water, and
   e. washed ester is treated with an basic adsorbent to obtain biodiesel.
2. A process as claimed in claim 1, wherein fatty acid glycerides are selected from the group consisting of vegetable oil, animal oil, fatty acids and mixture thereof.
3. A process as claimed in claim 1, wherein the adsorbent is selected from the group consisting of bauxite, clay, alumina, silica-alumina and distillation or combinations thereof.
4. A process as claimed in claim 1, wherein the catalyst is alkyl Tin oxide.
5. A process as claimed in claim 1, wherein the preferred temperature of the reaction is in the range of 150-200 °C
5. A process as claim 1, wherein the treatment with adsorbent is carried out at 20-60°C.
6. A process as claimed in claims 1, wherein the excess alcohol is recovered and recycled.
7. A process as claimed in claim 1, wherein the biodiesel obtained has an acid value in the range of 0.01-0.50 mg KOH/g.
8. A process as claimed in claims 1, wherein the biodiesel obtained has viscosity in the range of 4-7 cSt at 40 °C.
9. A process as claimed in claims 1, wherein the fatty acid alkyl esters produced are suitable for use as fuel in diesel engines, blending

component for petrodiesel and as additive in petrofuel for enhancing lubricity, cetane number and biodegradability.

AMENDED CLAIMS

[(received by the International Bureau on 05 October 2004 (05.10.04);
original claim 3 amended; remaining claims unchanged (1 page)]

1. An improved process for the preparation of fatty acid alkyl esters suitable for use as biodiesel, said process comprises the steps of,
    a. reacting fatty acid glycerides with an alcohol having 1-4 carbon atoms in the molar ratio of 3:1 to 30:1 of fatty acids and triglycerides respectively, at a temperature ranging between 70-300°C, pressure in the range of 1-30 bar, in presence of a organometalic catalytic compound of Tin with concentration of catalyst is in the range of 0.01 to 3 weight percent of the fatty acid glycerides;
    b. obtaining ester with glycerol;
    c. separating the glycerine from the fatty acid alkyl ester as immiscible phase by decantation;
    d. purifying the fatty acid alkyl esters by washing with water, and
    e. washed ester is treated with an basic adsorbent to obtain biodiesel.
2. A process as claimed in claim 1, wherein fatty acid glycerides are selected from the group consisting of vegetable oil, animal oil, fatty acids and mixture thereof.
3. A process as claimed in claim 1, wherein the adsorbent is selected from the group consisting of bauxite, alumina, silica-alumina and distillation or combinations thereof.
4. A process as claimed in claim 1, wherein the catalyst is alkyl Tin oxide.
5. A process as claimed in claim 1, wherein the preferred temperature of the reaction is in the range of 150-200 °C
5. A process as claim 1, wherein the treatment with adsorbent is carried out at 20-60°C.
6. A process as claimed in claims 1, wherein the excess alcohol is recovered and recycled.
7. A process as claimed in claim 1, wherein the biodiesel obtained has an acid value in the range of 0.01-0.50 mg KOH/g.
8. A process as claimed in claims 1, wherein the biodiesel obtained has viscosity in the range of 4-7 cSt at 40 °C.
9. A process as claimed in claims 1, wherein the fatty acid alkyl esters produced are suitable for use as fuel in diesel engines, blending component for petrodiesel and as additive in petrofuel for enhancing lubricity, cetane number and biodegradability.

STATEMENT UNDER ARTICLE 19

In the cited documents **WO 003/066567A, GB 2 072 167 A and JP 07 310090/A, Antolin *et. al.* and US 5,525,126,** the process comprises using an alkaline catalyst. which has several draw backs. When alkali catalysts are used for esterification and trans esterification of natural fats it consumes excess energy also the recovery of glycerol is difficult. Further, it involves one more extra step of neutralization. The result of the neutralization process, a lot of alkaline or acidic waste water is produced. Moreover, several steps such as evaporation of methanol, removal of saponified products, neutralization and concentration are needed for recovering the end product.

On, contrary the present invention is an improved process over the cited art and it relates to a process wherein esterification of free fatty acids and transesterification of glycerides occur simultaneously in one step, where a **neutral catalyst** is being used. The present invention uses moderate pressure (1-30bar) and temperature (150-300°c) without detrimental problems such as saponification and carbonization. In view of the same, the applicants feel that the teaching of cited art cannot be extrapolated to envisage the present invention. **In addition, in the present invention the molar ratio of catalyst to fatty acids is reduced by 30 times as compared to prior art process** Also the present process is possible to be carried out at a concentration in the range of 10-100% of fatty acid, which is never reported in any of the citations.

JP 07 310090 A

The above said citation reveals a multi step (6 steps) process. Where as the present process has been carried out in a single step.

GB 2 072 167 A

The applicant has amended the claim 3 to overcome the rejection of the above cited art.

Yean and Das

The cited art has been carried out with only pure tripamitin, (95%) as feedstock, in the presence of Tetrahydrofuran as a solvent to make the system homogeneous. Where as in the present invention natural vegetable oil is used and does not use any solvent_. No mention of transesterification of tripamitate to Methyl pamitate with Dioctyl tin oxide or butyl tin oxide catalysts have been made in the cited paper.